frequency of the two enantiomorphs. We might even predict that if a chemist were to spend his life in the preparation of innumerable and smallest physically sensible amounts of a normally racemoid substance, he would with fine enough apparatus ultimately be able to detect some amount of rotatory polarisation. In nature, where during countless ages (and in the past probably much more actively than at present) inorganic actions and reactions have taken place without man's aid, the production of chemical compounds of one-sided asymmetry must, on Prof. Japp's view of the relation of mechanical action to chance, undoubtedly have taken place. Further, according to Prof. Japp's fourth principle, we may look upon such asymmetrical compounds when they have once arisen as "breeders," or endowed with a power of selecting their own kind of asymmetry from other racemoid substances. Let us put this further statement on one side, however, and content ourselves solely with dissent from Prof. Japp's view expressed in the words:

"But the chance synthesis of the simplest optically active compound from inorganic materials is absolutely inconceivable. So also is the separation of two crystallised enantiomorphs under purely symmetric conditions."

On the contrary, if the theory expounded by Prof. Japp be correct, the inorganic origin of optically active compounds is not only conceivable, but it has a degree of probability which, however small, might be calculated when we know what is the minimum number of molecules in a physically just sensible solution, and what is the majority of enantiomorphs of one kind which will give a just measurable amount of rotatory polarisation.

It will indeed be a great gain if Prof. Japp's address calls more attention to this exciting subject, and leads to further experiment and research. KARL PEARSON.

The Moon's Course.

THE annual course which the moon takes in company with the earth round the sun was to me a long time a great puzzle, as it is to many others, until one day I demonstrated it to myself by the simplest method. Those who have some smattering of the heavenly bodies generally fail in their attempt to draw the moon's orbit; they find no explanation in popular works, and even in books written by well-known authors the subject of the moon's motion is altogether ignored. All that is found is a circle showing the moon's phases, and it is this circle which is fatal to the conception of the true orbit of the moon: even very young readers see the impossibility of a dozen or thirteen circles surrounding the sun.

For myself, failing to find assistance in books, I readily solved the problem by a practical method. I took a piece of wire and placed a cork on each end. I then drew a line on the table and advanced one, which I called the earth, along the line; the other cork necessarily followed it, and at the same time circulated round the earth in accordance with another force or motion given to it. Beginning with the moon behind the earth and making it pass to the right, both advancing forward, the moon made a curve until it reached the front of the earth, and then the latter still advancing, took the moon with it; this came on its left side, and then making another curve on that side, again reached the front; the two curves completing the orbit round the earth.

My object in writing at the present moment is, that when so many persons are spending their holidays at the sea-side and there is much talk of the tides together with the moon, I take the opportunity of demonstrating by a similar method the moon's course on the sands. I make one person walk in a straight line, marking this with a stick, which he drags behind him, and I call him the earth. I then place another person, the moon, at a given distance from the other, telling him to advance also, and at the same time circulate round his companion. Beginning behind, and taking the right hand, he goes forward, making a curve until he gets to the front, then passes to the left side and forms another curve just as in the other experiment. The four quarters of the moon are in this manner seen, and if the second person continually faces the earth the moon's monthly revolution is also completed.

As these demonstrations are made on a plane, the experiment may also be shown in another way. I wind some wire thirteen times (the number of the lunar months) round a cylinder, and then take off the coil thus made. I pull it out into a helix and join the ends of the wire. The course of the moon is shown in the spiral, although no correct proportions are attempted. This also gives some idea why the moon is sometimes seen on the horizon and sometimes at the zenith; the reason of which is a great difficulty to young people, as they find nothing about it in their books.

I make no pretence to be an astronomer or mathematician, and, indeed, it may be even a presumption to send this communication to a scientific journal; but if those who can teach fail to do so in popular books, there is no other method for the uninitiated to do the best for themselves. SAMUEL WILKS.

Grosvenor Street.

The Aurora of September 9.

THIS evening, at about three minutes past eight, on looking out towards the south-west, I was struck by the appearance of a shaft of white light stretching from that direction upwards towards a point 10° or 20° south of the zenith, and immediately on reaching open ground, whence a wide view was obtained, became aware that a fine display of aurora borealis was in progress. The shaft of light successively appeared and disappeared at intervals of a few seconds, and each time further eastwards, but each section was separated from the last by a space of unilluminated sky, as if there were regular spaces in the course of the beam incapable of being set aglow. Very soon after passing overhead the illumination became faint and disappeared eastwards, but now a strong glow appeared again near the horizon under a cloud south-west by west, and this rapidly grew upwards, repeating the phenomenon described in the first case. This occurred at least eleven or twelve times with little variation, except that the shaft became broader and more diffuse. The glow near the horizon south-westwards was always followed by the passage of the light across the sky within 1 to 1½ mins., and each travelling beam was separated from the last by an interval of 1½ to 2 mins. Meanwhile the sky north-westwards showed a pale white steady auroral light, which was at first attributed to the remains of twilight, but which continued to increase till about 8.30, when it was sufficiently strong to cast shadows and to show large print distinctly. This illumination extended slowly upwards from the north until it covered a great part of the sky up to the zenith, and seemed to be due to the luminosity of the great sheet of cirrus and cirrostratus which had covered the sky since 3.30 p.m., for it exactly imitated the distribution forms of the cloud which I had noted during the afternoon. This cloud, unilluminated, did not appreciably obscure the stars. The lacunæ of dark interspaces, while the surrounding sky shone with pale light, resembled bands or puffs of dark smoke, but remained fixed in the same situation, and altogether the phenomenon was strangely persistent, the only evident changes being a gradual shifting from north-west to north-east, and at about 9 p.m. a rosy streak north-eastwards. A little later fresh rays were shooting up from north-west by west, somewhat resembling those which an hour previously had emerged from south-west by west, but more steady and unbroken. At 9.55 a faint light was still to be seen in a north-westerly direction. Two hours before this grand exhibition we had been able to get a good view of the large spot on the sun, the intervening bank of cirriform cloud making his appearance through a telescope more like that of the moon. I have not seen any authoritative statements as to interruption of telegraphic messages or other magnetic disturbances coincident with or preceding the visible aurora, but no doubt some effect must have been observed.

Dunrozel, Haslemere, September 9. ROLLO RUSSELL.

A White Sea.

DURING the recent voyage of the P. and O. Co. s.s. *India* to London I had an opportunity (owing to the kindness of Captain Worcester) of witnessing what seems to be a rare phenomenon. The commander had seen it two or three times in the course of his experience. No one else on board knew anything about it, and I should be glad of a reference to any detailed description.

At 1.30 a.m. on the morning of August 22, in the Indian Ocean, the officer in charge saw ahead what seemed to be a low mist, and into which the vessel steamed. I was called about fifteen minutes later.

The whole sea was milk-white, much more luminous than the clear, starry sky, and there was a very definite horizon.

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There was no moon, the wind was south-west and light—the end of the monsoon; and although the sea was, as a matter of fact, breaking here and there, it appeared a calm white sheet, only disturbed by the displacement waves near the ship and a very occasional breaker elsewhere; showing through it were occasional flashes of the ordinary brilliant phosphorescence. It will therefore be seen that the luminosity of the "white sea" was rather less than that of a breaking wave with the same illumination. A bucket of water drawn showed nothing unusual. Samples with and without alcohol were preserved.

A fireball was thrown overboard, and burnt on the surface of the water; this was done in order to see if any fog or mist was present. There was no indication of anything of the kind.

On the port side of the ship is an aperture through which the surplus water from the bath tanks is constantly ejected, slightly warmed. This water, as it fell on to the sea, appeared much blacker than the sea, and floated for a few seconds as a black mass; unfortunately, the same shoot is used for the ashes at times. But the ejected water is quite white by daylight.

The appearance of the sea lasted about an hour, then faded, then brightened again, and was quite bright at daylight, 4.15 a.m.; so that it was seen throughout a distance of nearly fifty miles. A slight recurrence was observed the following night, when the monsoon was blowing more strongly.

At 3 o'clock on the 22nd, in the midst of the "white sea," the latitude was 10° 35′ N. and the longitude 63° 25′ E.; the temperature of the air was 77° F., that of the water 77° F. Specific gravity of the water by ship's instrument No. 1314 = 25.

I shall be glad to hand over the specimens of water to any one interested. James W. Barrett.

22 Cavendish Square, September 13.

Deep-Sea Dredging, and the Phosphorescence of Living Creatures, at Great Sea Depths.

May I call attention to this most interesting subject, upon which so little is known, and with reference to the exploration of the bottom of tropical seas; *nothing is known*, though there is here a mine of natural history wealth probably of unexampled magnitude. In that interesting work on "The Depths of the Sea," by Sir Wyville Thomson, published more than twenty years ago, we get a glimpse of a hitherto unworked zoological province, which creates a desire to know more from the richness and beauty revealed, where it would be least expected.

He writes—"We had a gorgeous display of luminosity, coming down the Sound of Skye, while dredging in 100 fathoms.

"The Pavonariæ came up, resplendent with a pale lilac phosphorescence, like the flame of cyanogen gas—not scintillating, but constant and sufficiently bright to make every portion of a stem distinctly visible, and the stems were a metre long, fringed with hundreds of polyps; and from the number of specimens brought up, we must have passed through a luminous forest of them.

"Among Echinoderms, *Ophiacantha spinulosa* was one of the prevailing forms, and we were greatly struck with the brilliancy of its phosphorescence. Very young Ophiacantha shone very brightly also.

"At 344 fathoms, some of our hauls were taken late in the evening, and the tangles were sprinkled over with stars of the most brilliant uranium green. The light was not constant, nor continuous all over the stars, but sometimes it struck out a line of fire all round the disc; flashing or glowing up to the centre; then that would fade, and the whole five rays of *Ophiacantha spinulosa* would light up at the ends, and spread the fire inwards.

"At 557 to 584 fathoms, many of the animals dredged were most brilliantly phosphorescent. In some places, nearly everything brought up seemed to emit light, and the very mud itself was perfectly full of luminous specks. The Pinnatulæ, Virgulariæ, and Gorgoniæ, shone with a lambent white light, so bright that it showed quite distinctly the hour on a watch.

"The light from *Ophiacantha spinulosa* was a brilliant green, coruscating from the centre of the disc, now along one arm, now along another; and vividly illuminating the whole outline of the star-fish."

From a depth of 567 fathoms, a beautiful scarlet Urchin, *Echinus microstoma*, was obtained. In the year 1846 Keferstein mentions having seen in Stockholm a Crustacean taken from the depth of 1400 fathoms, of a bright colour. In 1869 and 1870 dredging was carried down to 2435 fathoms by H.M.'s ship *Porcupine*, and the fact that there is an abundant and characteristic invertebrate fauna at that great depth was placed beyond question; but the bottom of the deep sea that has been fairly dredged, may still be reckoned by the square yard; while every haul of the dredge, hitherto used, has brought to light new and unfamiliar forms.

In the number of Nature for June 30 of this year, there is a most interesting article on deep-sea fishing by means of a trap, an illustration of which is given. These traps are said to have been used at a depth of three thousand fathoms, with complete success. On one occasion a trap that had been lying on the bottom of the Mediterranean, at 700 fathoms depth, for twenty-four hours, brought up 1198 fish, called *Simenchelys parasiticus*. On another occasion, a new crab, one of the largest ever known, *Geryon affinis*, was brought up, and there were sixty-four specimens of it. All this shows how much remains to be done in this province of natural history. E. L. J. Ridsdale.

Rottingdean.

The Injection of Cocaine as a Remedy for Stings.

As no one has answered the question asked by Sir J. F. D. Donnelly in your issue of September 8, will you allow me to say that the hypodermic injection of cocaine, or indeed its use in any form, is never quite free from risk. As with most other drugs there is an element of idiosyncrasy, which sometimes produces unexpected and unpleasant results. I believe these occur more frequently, when the drug is injected, than when it is simply applied to the mucous membrane; and when they do occur, they are very alarming. I know that some dentists have given up the practice of injecting cocaine into the gums before extraction on this account, and having been present once when it was done, I should not consent to it again. What we have to remember with regard to the use of all powerful drugs is this, that a few individuals under all conditions, and nearly all under certain conditions, are specially susceptible to their action, and that we cannot determine *à priori* either the individuals so predisposed, or the conditions which render susceptible those not specially predisposed. These drugs must therefore be used with caution, and not be regarded as wholly innocuous.

I should say the hypodermic injection of cocaine into the tongue is undesirable, and only to be done if the pain is intense or the swelling such as to threaten life, in which case it would probably be useful. I would add that so far as I know no *solutions* of cocaine keep well. M.D., Oxon.

THE GEOGRAPHY OF THE UNITED STATES.[1]

This volume completes the description of the North American continent with the exception of Mexico; but, although an excellent account of the United States, it leaves North America itself still undescribed. The general reader, of course, will not miss what he has not been trained to expect; and, if he leaves the conception of geography as a science capable of systematic study out of account, the professed geographer will find much valuable material collected with discrimination and stated clearly and modestly. Indeed, except for an implication on the first page that the United States are in many respects more civilised than Canada, the English reader will find nothing to disturb his equanimity even in the account of the revolutionary war or the feats of the *Alabama*. Mr. Gannett writes always as a good American, but is ready to recognise the defects of his country when necessary, and careful to buttress all agreeable statements with statistics which more than prove them.

Of the arrangement of the matter it is impossible to speak with the same satisfaction. The chapters do not flow in the natural sequence desirable in a literary work,

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[1] "Stanford's Compendium of Geography and Travel" (New Issue). North America. Vol. II. "The United States." By Henry Gannett, Chief Geographer of the United States Geological Survey. Maps and Illustrations. Pp. xvi + 466. (London: Edward Stanford, 1898.)

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